tailed statement of the farms inundated in the vicinity of Savannah, in which statement the total area of the submerged farms is estimated at more than 9,000 acres, about 60 per cent. of which was under cultivation.

Greenfield, Franklin Co., Mass.: the heavy rains on the 18th caused numerous washouts on the railroads in this county.

The following is from "The New York Tribune" of August 24th:

CHARLESTON, S. C., *August* 23.—Reports received this morning from the inundated rice fields of the South Santee indicate that the damage is not general. High tides have prevented the freshet from covering the large plantations of the southern district along the river, and the greater part of the crops is considered safe. On the North Santee colored planters on small farms have suffered disastrously, their crops being reported as totally destroyed.

Cleburne, Johnson Co., Tex.: the unusually heavy rainfall on the 30th caused freshets in East and West Buffalo creeks; many houses and fences were washed away, and several persons drowned.

The following is from the "Chicago Tribune" of the 31st:

FORT WORTH, TEX., *August* 30th.—North Texas is being visited by unprecedented rains for the month of August. It is a rare thing for more than enough rain to fall in August to lay the dust. Up to yesterday three heavy rains had fallen during the month, but they were not general. Yesterday afternoon it began to rain, and for twenty-four hours has kept it up almost continually. Rivers and streams have risen from five to twenty feet. The Trinity, Brazos, and Red Rivers are out of their banks for the first time in two years. The rain of yesterday and to-day has been general, and has averaged three inches throughout this section. One week ago, at Waco, prayer-meetings were held to pray for a cessation of the long drought. To-night people on the lowland are moving out of their homes to keep from being drowned. Serious washouts are reported south of here on both the Missouri Pacific and the Santa Fé. The Santa Fé bridge across the Wichita, in the Indian Territory, is in danger from a large amount of driftwood in the river. The flood at Cleburne is most severe. A little creek called Buffalo Bayou was turned into a raging torrent in twelve hours, carrying away houses, farms, bridges, and everything in its course. One family, consisting of nine persons, was carried away and drowned before they could get out of their house. Great damage has been done in every direction. As far as heard from eleven people have been drowned.

The following is from the Saint Louis, Mo., "Globe-Democrat" of September 1, 1887:

FORT WORTH, TEX., *August* 31.—At noon to-day heavy rains began falling in this section and continued for several hours. The Trinity River was higher to-day than yesterday, and reports reach the city to-night of two serious washouts on the Fort Worth and Rio Grande Railroad. All trains north and south on the Missouri Pacific have been abandoned, except a local to Denison. No trains are running either north or south on the Gulf, Colorado, and Santa Fé, and no trains on the Houston and Texas Central between Fort Worth and Waxahachie. The Texas and Pacific is still in trouble near Eagle Ford. A north-bound Missouri Pacific train, due here Monday night, is isolated between two floods at a point between Itaska and Grand View, and there is no prospect of its relief until to-morrow night. The passengers have suffered considerably from hunger.

Tucson, Ariz., 31st: the heavy rains during the month in the surrounding mountains have caused numerous freshets in the Santa Cruz and Rillito rivers.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Saint Vincent, Minn.: an aurora in the form of a whitish arch resting on a dark base was observed at 11 p. m. on the 15th; twenty minutes later a second arch appeared above the first, with a well-defined colored space between them. Numerous beams having a tremulous motion rose from the upper arch; these gradually grew larger and for about twenty-five minutes moved upward and downward, changing color from pale yellow to blue, and finally disappearing at 1.18 a. m. on the 16th.

Northfield, Vt.: an auroral display was observed from 9.00 to 10.15 p. m. on the 31st; it consisted of bright streamers extending upward about 20°, and azimuth 80°; the display was most brilliant at 9.30 p. m.

Eastport, Me.: an auroral arch was observed from 8.10 to 9.45 p. m. on the 14th; it extended from the northwest to northeast and to an altitude of about 130°; four beams reaching an altitude of about 5° were seen between 8.30 and 9.00 p. m.

Auroras were noted on other dates as follows:

1st, Cresco, Iowa. 9th, Vevay, Ind. 11th, Poplar River, Mont. 13th, Eastport and Orono, Me.; Nashua, N. H.; Egg Harbor City, N. J.; Northfield, Vt. 14th, Webster, Dak.; Eastport and Orono, Me.; Saint Vincent, Minn.; Poplar River, Mont.; Nashua, N. H. 15th, Forts Buford and Totten, Dak.; Saint Vincent, Minn. 16th, Poplar River, Mont.; Egg Harbor City, N. J. 20th, Boston, Mass. 23d, Vevay, Ind.; Duluth, Minn. 28th, Webster, Dak.; Eastport, Me.; Traverse City, Mich.; Manitowoc, Wis. 29th, Fort Totten, Dak.; Moorhead, Minn.; Poplar River, Mont. 31st, Pekin, Ill.

THUNDER-STORMS.

Thunder-storms are reported to have occurred in the various states and territories on the several dates as follows:

1st.—Ark., Colo., Conn., Dak., Fla., Ga., Ill., Ind. T., Kans., Ky., La., Md., Mass., Mich., Miss., Mont., Nebr., N. J., N. Y., N. C., Ohio, Oregon, Pa., S. C., Tenn., Tex., Va., W. Va., Wis., Wyo.

2d.—Ala., Ark., Conn., Dak., Fla., Ga., Ind., Ky., Mass., Mich., Minn., Miss., Mont., Nebr., N. H., N. J., N. Y., N. C., Pa., S. C., Tenn., Tex., Vt., Va., W. Va., Wis.

3d.—Ark., Dak., Fla., Ga., Ill., Ind. T., Iowa, Kans., La., Mass., Mich., Mo., Nebr., N. J., S. C., Tenn., Tex., Wis.

4th.—Ala., Ark., Colo., Dak., Del., D. C., Fla., Ga., Ill., Ind., Iowa, Kans., Mich., Minn., Mo., Nebr., N. Y., N. C., Ohio, Pa., Tenn., Tex., Vt., Va., Wyo.

5th.—Ala., Ark., Colo., Fla., Ga., Ill., Ind., Iowa, Kans., Ky., La., Mich., Miss., Nebr., N. J., N. Y., N. C., Ohio, Pa., Tenn., Tex., Vt., Va.

6th.—Ala., Cal., Conn., Dak., D. C., Fla., Ga., Ind. T., La., Me., Md., Mass., Mont., N. J., N. Y., N. C., Pa., S. C., Tenn., Tex., Utah, Vt., Va.

7th.—Ala., Ariz., Dak., Fla., Ga., Idaho, Ind. T., Miss., Mont., Nebr., N. C., Oregon, S. C., Tex., Wash.

8th.—Ala., Ariz., Cal., Dak., Fla., Ga., Iowa, Mich., Minn., Mont., Nebr., S. C., Wis.

9th.—Ariz., Ark., Colo., Dak., Fla., Iowa, La., Mich., Mont., Nebr., Oregon, Tex., Utah, Wis., Wyo.

10th.—Ariz., Ark., Colo., Dak., Fla., Ill., Iowa, Kans., Me., Mich., Minn., Mont., Nebr., N. H., Oregon, Pa., Tenn., Tex., Vt., Wis.

11th.—Ariz., Ark., Colo., Conn., D. C., Fla., Ill., Ind., Ind. T., Iowa, Kans., Ky., Me., Md., Mass., Mich., Mo., Nebr., N. H., N. J., N. Mex., N. Y., N. C., Oregon, Pa., R. I., S. C., Tex., Utah, Vt., Va., Wash., Wis., Wyo.

12th.—Ariz., Ark., Colo., Dak., D. C., Ill., Ind., Iowa, Kans., Ky., Me., Miss., Mont., Nebr., N. J., N. C., Ohio, Pa., Tenn., Tex., Utah, Va., Wash., Wyo.

13th.—Ariz., Ark., Cal., Colo., Dak., Fla., Ill., Ind., Iowa, Kans., Mo., Mont., N. C., Tenn., Tex., Utah, Va., Wyo.

14th.—Ariz., Ark., Colo., Dak., Fla., Ga., Ill., Ind., Ind. T., Iowa, Kans., Ky., Mich., Miss., Mo., Mont., Nebr., N. C., Pa., S. C., Tenn., Tex., Utah, Va., Wis., Wyo.

15th.—Ala., Ariz., Ark., Cal., Colo., Dak., Fla., Ga., Ill., Ind., Ind. T., Kans., Ky., Mo., Mont., Nebr., N. Mex., N. C., Ohio, Pa., S. C., Tenn., Tex., Va., W. Va., Wyo.

16th.—Ala., Ariz., Ark., Colo., Dak., Fla., Ga., Ill., Ind. T., Kans., Me., Miss., Mo., Nebr., N. H., N. Mex., N. C., Pa., S. C., Tenn., Tex., Vt., Va.

17th.—Ala., Ariz., Ark., Colo., Dak., D. C., Fla., Ga., Ill., Ind., Ind. T., Iowa, La., Mich., Minn., Nebr., N. Mex., N. C., S. C., Tenn., Tex., Va., W. Va., Wyo.

18th.—Ala., Ariz., Colo., Conn., Dak., Fla., Ga., Ill., Kans., La., Mass., Mich., Mont., Nebr., N. J., N. Y., N. C., Ohio, Pa., S. C., Tex., Va., Wis.

tions thirty-three signals, the verifications of which it was impracticable to determine.

In fifty-nine instances winds were reported which would have justified the display of cautionary signals, but for which no signals were ordered.

No cold-wave signals were ordered during the month.

LOCAL VERIFICATIONS.

The following is from the report of the "Michigan State Weather Service" for August, 1887:

There are now one hundred and forty stations in Michigan where weather signals are displayed, and seven railroads on which weather signals are carried, there being twenty-five trains leaving terminal points in the morning which carry weather signals.

The percentage of verification of weather signals for August is as follows: (the verification is taken from reports of displaymen furnished this office monthly) temperature, 84.9 per cent.; weather, 82.1 per cent.; temperature and weather, 83.4 per cent.

The percentage of verification of weather predictions for August on the D., G. H., and M. R'y., is 83.3 for weather and 85.2 for temperature; on the C. & G. T. R'y., weather, 86.0, and temperature, 85.7; P. H. & N. R'y., weather, 84.1, and temperature, 85.3.

The following is from the August, 1887, report of the "Minnesota Weather Service:"

Verifications of weather signals for Minnesota were 75 per cent. for weather and 74 per cent. for temperature.

The following is from the August, 1887, report of the "North Carolina Weather Service:"

The percentage of verifications as determined from seven points in the state is as follows: weather, 76.0 per cent.; temperature, 75.9 per cent.

The following is from the August, 1887, report of the "South Carolina Weather Service:"

The percentage of verification of the weather and temperature predictions for the whole state was: for weather, 81.5 per cent.; for temperature, 82.5 per cent.

The following is from the "Tennessee State Board of Health Bulletin" for August, 1887:

The percentage of verification of weather and temperature predictions, furnished daily from the Signal Office at Washington to the various stations in the state during the month, was for the state: weather, 91.4 per cent.; and temperature, 95.5 per cent.

ERRATUM.

In the tornado table on page 167 of the June REVIEW, the date of the tornado at Lead Hill, Ark., given as June 4th, should read May 4th.

STATE WEATHER SERVICES.

The following extracts are republished from reports for August, 1887, of the directors of the various state weather services:

The "Arkansas Weather Service," W. U. Simons, Signal Corps, director:

The first half of the month was very warm, and high temperatures were reported generally. Of these the highest were 110° at Lead Hill on the 11th and 104° at Heber on the 14th. In most other parts of the state the highest temperatures occurred on the 2d to the 5th, and averaged 100° to 104°. The observer at Lead Hill reports the first part of the month hotter than during any previous August in the last six years. The first twenty days of the month covered the heated term. A cool wave passed over the state from the 21st to the 27th, and caused a fall of temperature of from 8° to 20°, and showers of rain in most cases. The average for the month was 79°.4.

The rainfall was very partially distributed, and while the phenomenal amount of 8.28 inches fell in Marion county, which is 3.48 inches above the August average there for the past five years, there were some sections in which none whatever fell. The most general rains fell in the northwestern part of the state, and the least in the southern and southeastern portions. The average for the state was 2.58 inches.

The heaviest rainfalls were 2.15 inches, at Eureka Springs; 2.00 inches, at DeVall's Bluff; 1.94 inches, at Altus; 1.65 inches, at Palarm; 1.80 inches, at Osceola; 1.62 inches, at Lead Hill; 1.50 inches, at Russellville and Dallas. Thunder-storms, with rain, were reported from Eureka Springs, Washington, and Lead Hill the 1st, and lightning and thunder on several other dates from a number of places.

Hail fell at Lead Hill during the storm of the 1st, and again on the 14th, doing considerable damage.

Meteors were observed at Lead Hill on the 9th, 10th, and 11th, and at Eureka Springs and Little Rock on the 10th and 11th, in large numbers and of considerable brightness.

The "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, director:

The month of August, 1887, was warmer than usual, the mean temperature, 75°, being 1°.5 above the normal for the month. The first half of the month was very hot, the mean temperature of that period, 80°, being over a degree higher than the normal for the same dates in the past thirteen years. The period from 16th to 22d had a normal temperature of about 74°. On the 23d a cool wave swept over the state, resulting in a fall of 13° in the daily mean temperature on the 24th, and minimum temperatures of 40° to 50° in the northern and central divisions of the state. The highest temperatures were reported from 1st to 4th and 9th to 11th, these dates covering the extreme heated periods during the month.

There was an average percentage of sunshine during the month, as compared with the August normal of the past six years, ranging from 55 per cent. in the northern division to 70 per cent. in the southern division.

Heavy rains (3.50 to 6 inches) fell in the extreme northern counties of the state, moderately heavy (2 to 3.50 inches) in the north-central section, and light in the remainder of the state, except in a few counties that received heavy local showers; the average rainfall for the state was 2.50 inches, the northern division receiving an average of 3.50 inches, the central 2.50, and the southern less than 1.50 inches. The heaviest daily rainfalls (about 3 inches) were reported from Stephenson, Putnam, and Henry counties on the 10–11th.

Frost was reported as having occurred on the bottom lands in the north-central section of the state, and six counties in that section reported minimum temperatures of from 40° to 44°.

A violent local storm occurred in Shelby county on August 4th that destroyed everything in its path, twisting off trees fifteen inches in diameter, and moving a large church thirty feet from its foundations. The path of this tornado was from twenty to one hundred yards in width, the accompanying cloud being black and funnel-shaped.

The "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director:

The pressure for August was slightly below the normal, with only slight fluctuations, and small range. The greatest recorded was at Spiceland, where the barometer read 30.310 on the 31st, and the least at Indianapolis on the 17th, the barometer reading 29.760, the readings in both cases being reduced to sea-level. The greatest range at any station was 0.510, at Vevay.

The temperature was about 2° above the normal. At a great majority of stations the thermometer reached or passed 100° as a maximum. The highest point reached was 104°, at Brookville and Butlerville, on the 4th and 5th, and the lowest, 40°, at Mauzy, on the 29th.

The precipitation was nearly two inches below the normal, which adds to the already large deficiency this year, and increases the damage to standing crops, pastures, etc., and largely diminishes the water supply in many localities. Nor is this deficiency confined to this state and its neighborhood, but prevails over the greater portion of the country—in the south Atlantic states, the Gulf states, the Ohio and Tennessee valleys, the Lake region, and the upper Mississippi valley. It does not follow, however, that the great deficiencies reported in many localities necessarily cause extensive injury to the agricultural interests of the people living there. There is always considerable fluctuation in the rainfall of any section from year to year, and agricultural welfare depends more upon the equitable distribution than in the aggregate amount thereof. A county may, any year, have the average amount of rainfall, and have all usual crops a failure, owing to its irregular distribution. On the other hand the annual amount may fall many inches below the average without any serious damage, if the amount that falls be distributed to the best advantage. In some portions of the western slope the annual rainfall is usually amply sufficient to produce excellent crops, if it fell in proper season; but as it nearly all falls in the winter months, and little or none during the spring and summer, the result is that agricultural operations can not be carried on with any surety of success.

Through Indiana the August rainfall was very irregular, some places getting heavy rains, while places close by got very little. The southern counties got least and the central most. The greatest amount reported was 6.83 inches, at Fortville, and the least, 0.05, at Saint Meinrad's Abbey, and 0.25 at Princeton. Several heavy rains have been reported, running from one to two inches and over. The heaviest was at Fortville on the 17th, 2.21 inches, while at Princeton the observer reports that only 1.50 has fallen in three months.

Auroras were reported at Vevay on the 9th and 23d. Solar halos were reported at Vevay on the 12th and 16th, and at Rockville on the 16th; lunar halos at Vevay on the 11th and 13th, and at Butlerville on the 3d and 6th.

Brilliant meteors were observed at Vevay on the 4th, 7th, 9th, 10th, and 20th.

No frost has been reported during the month, but heavy dews have been reported from various stations.